

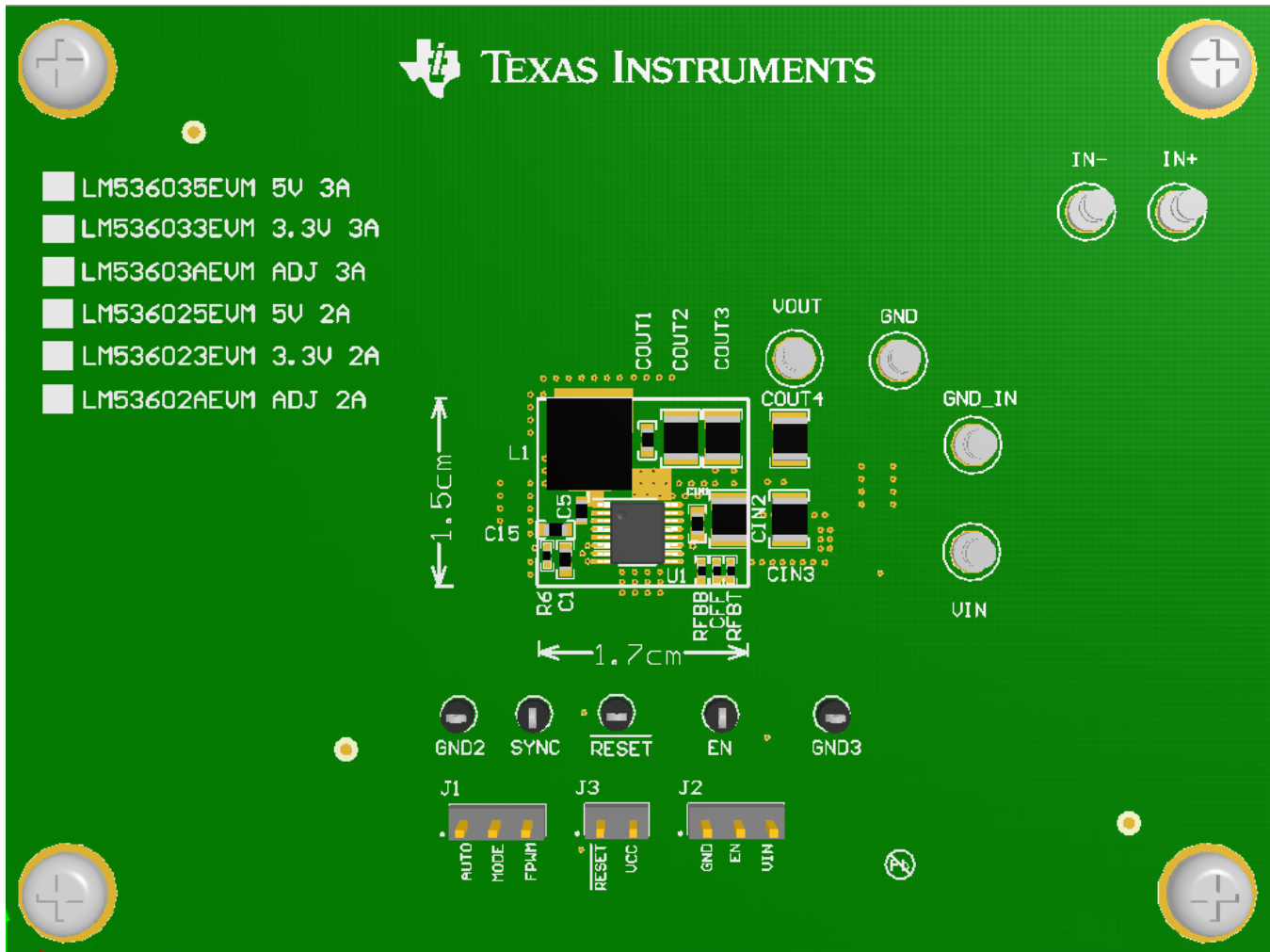
# LM536035EVM

## User's Guide



Literature Number: SNVU470  
June 2015

## Introduction



### Evaluation Board

The LM53603 Evaluation Module helps designers evaluate the operation and performance of the LM53603 wide input voltage automotive buck regulator. The board enables the user to test external synchronization, RESET/Power Good output, precision enable and operation in both Auto mode (with high efficiency operation and light load) and Forced PWM mode (FPWM). The EN pin is rated up to  $V_{in}$  while the SYNC pin, RESET pin and the mode pin (FPWM) are rated up to 6V. Please refer to the LM53603 datasheet for detailed information on the IC parameters and operating characteristics.

The LM536035EVM is ready to operate. There are two sets of input terminals. The first one labeled IN+,IN- (positive, negative) connects the power supply to the LM53603 regulator through and EMI filter with optional common mode choke. The second set of terminals labeled VIN, GND\_IN (positive, negative) connects the supply directly to the LM53603, bypassing the EMI filter.

The output terminals are labeled VOUT and GND with posts located on top of the regulators. Additional pads are available for optional extra input and output capacitance: CIN3 and COUT4.

There are three jumper connectors that are used in order to interact with the LM53603. A jumper can be connected on each of these terminals. Refer to the schematic in this document for details on the connection of these jumpers.

**Table 2-1. Jumper Options**

Designator	Attached Function	Jumper Position	Result
J1	Mode (FPWM)	1-2 (AUTO-MODE)	Auto mode. The part lowers frequency at light load to increase efficiency, diode emulation active
		3-2 (FPWM-MODE)	FPWM mode: The part operates does not reduce frequency at light load, no diode emulation
J2	Enable (EN)	1-2 (GND-EN)	The part is enabled (connection to Vin)
		3-2 (VIN-EN)	The part is disabled (connection to Gnd)
J3	PowerGood/Reset output (RESET)	1-2	RESET output is pulled up to VCC
		no jumper	RESET output pull-up disconnected. user can connect to pull-up source of her/his choice (<6V, ensure a pull-up resistance is connected to limit current when RESET pin goes low)

## 2.1 Quick Start

Connect the power supply to either the IN+, IN- terminal pair or the VIN, GND\_IN terminal pair. With the default jumper power connection, the board should begin operating as soon as proper voltage is applied to the input. The default mode of operation is normal or "auto" mode (refer to the datasheet for more details on the operating mode). For the ADJ version, the default output voltage is 5V. To change the output voltage, modify RFBB and RFBT resistors as explained in the datasheet. Depending on the output voltage, a change in CFF might be required to achieve adequate transient response.

## Operating Curves

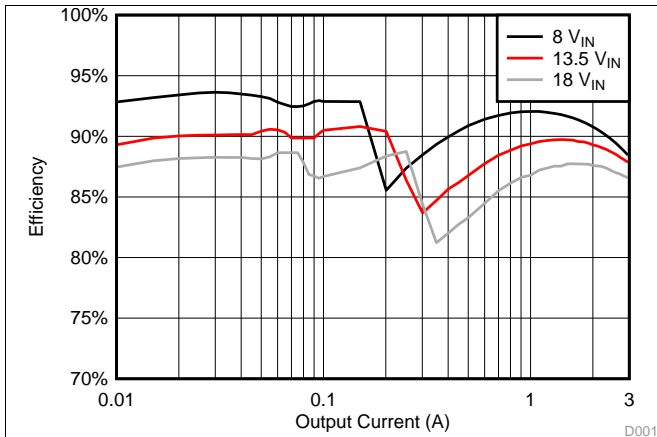


Figure 1. Efficiency (AUTO Mode)

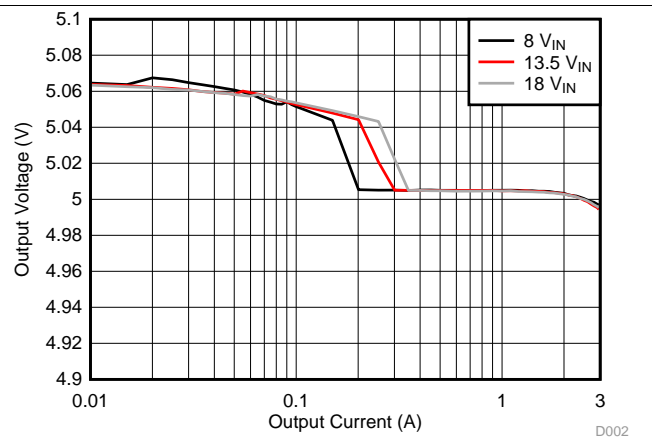


Figure 2. Load Regulation (AUTO Mode)

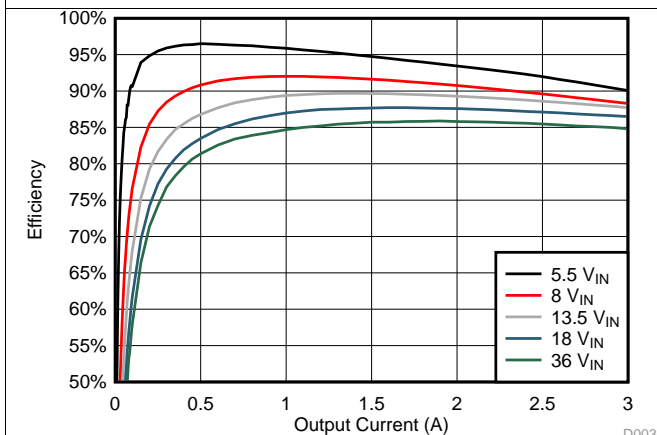


Figure 3. Efficiency (FPWM Mode)

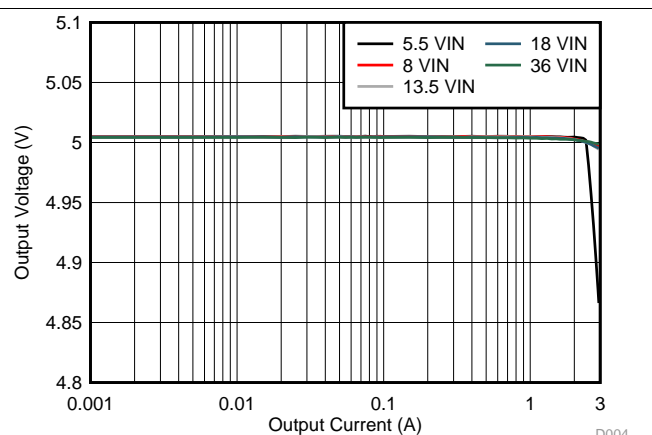


Figure 4. Load Regulation (FPWM Mode)

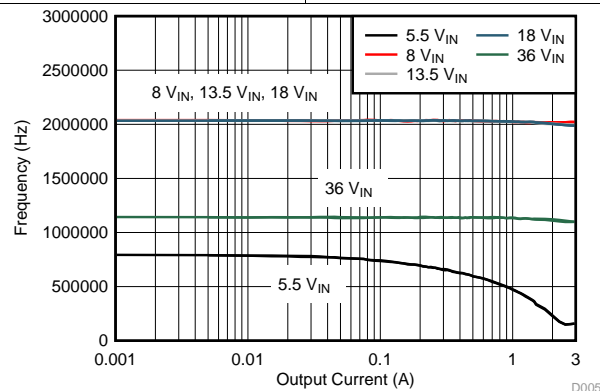


Figure 5. Frequency vs Output Current (FPWM Mode)

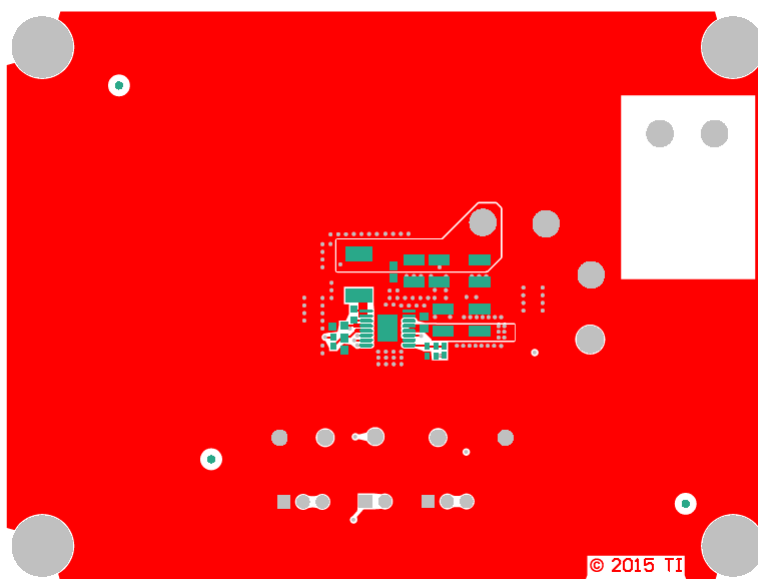
## Bill of Materials for the Fixed 5V EVM

The following bill of material applies to the 5V fixed EVM version.

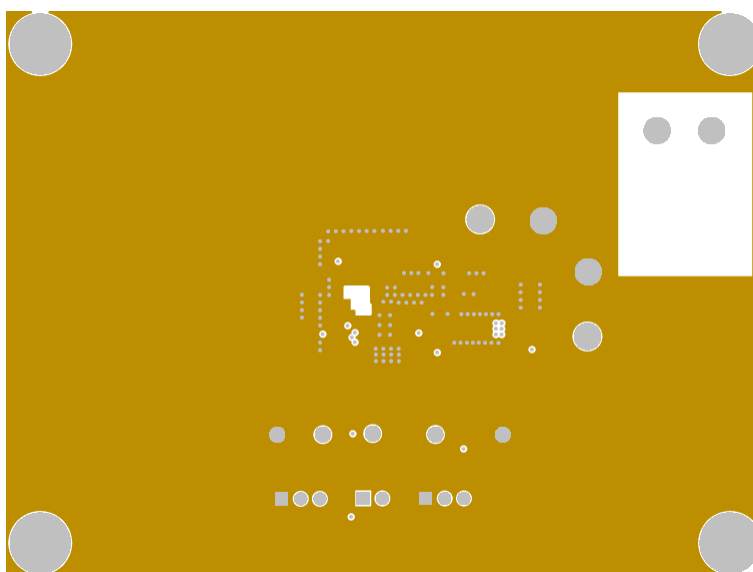
**Table 4-1. Bill of Materials**

Designator	Qty	Value	Description	Part Number
C1	1	0.1uF	CAP, CERM, 0.1 $\mu$ F, 50 V, +/- 10%, X7R, 0603	06035C104KAT2A
C5	1	0.47uF	CAP, CERM, 0.47 $\mu$ F, 25 V, +/- 10%, X7R, 0603	GRM188R71E474KA12D
C7, C13, COUT1	3	0.1uF	CAP, CERM, 0.1 $\mu$ F, 50 V, +/- 10%, X7R, 0603	GRM188R71H104KA93D
C8	1	1uF	CAP, CERM, 1 $\mu$ F, 50 V, +/- 10%, X7R, 0805	GRM21BR71H105KA12L
C9, C14, CIN2	3	10uF	CAP, CERM, 10 $\mu$ F, 50 V, +/- 10%, X7R, 1210	GRM32ER71H106KA12L
C15	1	3.3uF	CAP, CERM, 3.3 $\mu$ F, 10 V, +/- 10%, X7S, 0603	C1608X7S1A335K080AC
CBULK	1	22uF	CAP, AL, 22 $\mu$ F, 50 V, +/- 20%, 0.88 ohm, SMD	EEE-FK1H220P
CIN1	1	0.01uF	CAP, CERM, 0.01 $\mu$ F, 50 V, +/- 10%, X7R, 0603	GRM188R71H103KA01D
COUT2, COUT3	2	22uF	CAP, CERM, 22 $\mu$ F, 16 V, +/- 10%, X7R, 1210	GRM32ER71C226KE18L
EN, GND2, GND3, RESET, SYNC	5	Black	Test Point, Miniature, Black, TH	5001
FB1	1	600 ohm	Ferrite Bead, 600 ohm @ 100 MHz, 3 A, 1210 (H=2.5mm)	FBMH3225HM601NT
GND, GND_IN, IN+, IN-, Vin, Vout	6	Double	Terminal, Turret, TH, Double	1502-2
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	NY PMS 440 0025 PH
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	1902C
J1, J2	2		Header, 100mil, 3x1, Gold, TH	HTSW-103-07-G-S
J3	1		Header, 100mil, 2x1, Gold, TH	HTSW-102-07-G-S
L1	1	2.2uH	Inductor, Shielded, Powdered Iron, 2.2 $\mu$ H, 6.5 A, 0.034 ohm, SMD	IHLP2525BDER2R2M01
LF1	1	2.2uH	Inductor, Shielded Drum Core, Ferrite, 2.2uH, 3A, 0.026 ohm, SMD	74408943022
R2, R3, R7	3	100k	RES, 100 k, 1%, 0.1 W, 0603	RC0603FR-07100KL
R6	1	3.0	RES, 3.0, 5%, 0.063 W, 0402	CRCW04023R00JNED
R8, R9	2	0	RES, 0, 5%, 0.25 W, 1206	RC1206JR-070RL
RFBT	1	0	RES, 0, 5%, 0.063 W, 0402	RC0402JR-070RL
SH-J1, SH-J2, SH-J3	3	1x2	Shunt, 100mil, Gold plated, Black	969102-0000-DA
U1	1		5V, 3A, Buck Regulator For Automotive Applications, PWP0016H	LM536035QPWPRQ1
COUT4	0	22uF	CAP, CERM, 22 $\mu$ F, 16 V, +/- 10%, X7R, 1210	GRM32ER71C226KE18L
CFF	0	91pF	CAP, CERM, 91 pF, 50 V, +/- 5%, C0G/NP0, 0402	GRM1555C1H910JA01D
CIN3	0	10uF	CAP, CERM, 10 $\mu$ F, 50 V, +/- 10%, X7R, 1210	GRM32ER71H106KA12L
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A
LCF1	0	11uH	Coupled inductor, 11 $\mu$ H, 2.5 A, 0.03 ohm, SMD	744273102
RFBB	0	20.0k	RES, 20.0 k, 1%, 0.063 W, 0402	CRCW040220K0FKED

# PCB Layout

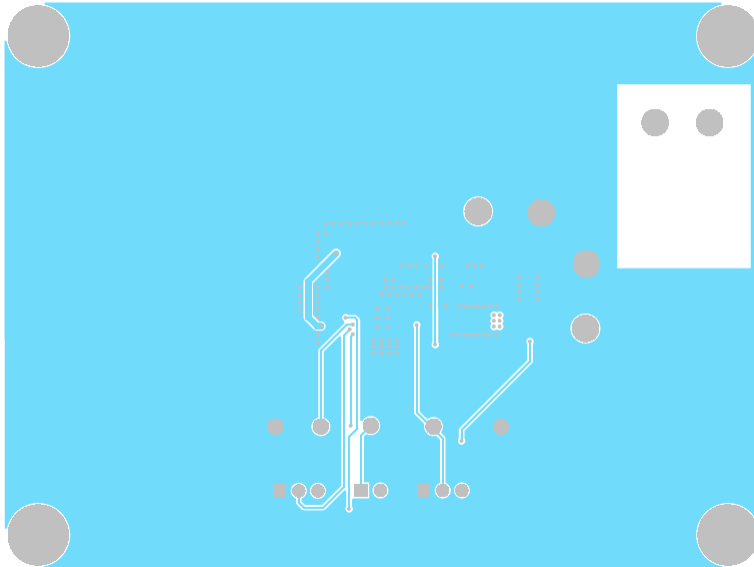


Top Layer

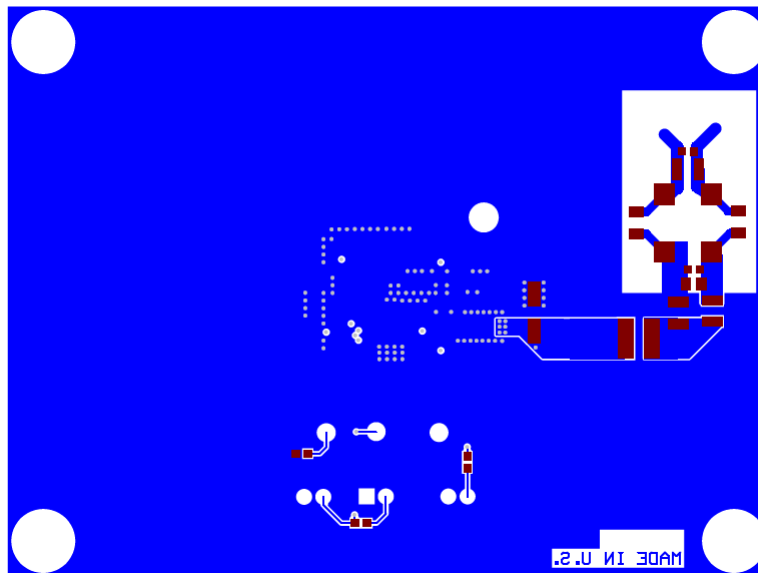


Mid Layer 1

### Mid Layer 1 (continued)

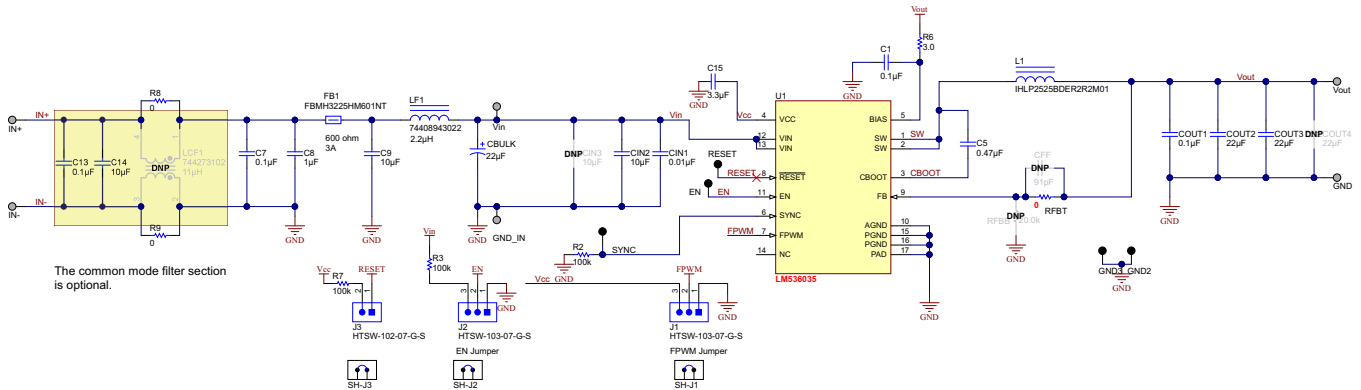


### Mid Layer 2



### Bottom Layer

# Schematic



**Schematic for the LM53603EVM Fixed 5V, 3A Output**



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